Unlock the Problem

The Tech Club compared the weights of three cell phones. Estéban’s phone weighed 4.7 ounces. Jill’s phone weighed \(4\frac{3}{5}\) ounces. Mona’s phone weighed 4.35 ounces. Who has the phone with the lightest weight?

You can use a number line to compare fractions and decimals.

**Remember:** Greater values on a number line lie farther to the right.

**Try This!** Compare \(\frac{1}{5}\), \(\frac{5}{8}\), and 0.2. Which number has the greatest value?

- Mark each value on a number line.

The greatest number is _____. **Explain** how you decided.
For 1–2, identify the points on the number line. Then write the greater number.

1. point $A$ as a decimal

2. point $B$ as a fraction

Locate each number on a number line. Then complete the sentence.

3. $0.55, \frac{2}{5}, 0.46$

The number with the greatest value is ________.

4. $0.4, \frac{3}{4}, 0.15$

The number with the greatest value is ________.

5. $2\frac{2}{3}, 2.45, \frac{22}{5}$

The number with the least value is ________.

6. $3.95, 3\frac{5}{6}, 3\frac{4}{5}$

The number with the greatest value is ________.

7. Hannah made 0.7 of her free throws in a basketball game. Abra made $\frac{9}{10}$ of her free throws. Dena made $\frac{3}{4}$ of her free throws. Who was the best shooter? Explain.
Order Fractions and Decimals

Essential Question: How can you order decimals, fractions, and mixed numbers on a number line?

Unlock the Problem

In tennis, Jocelyn’s serve takes 0.97 of a second to reach her opponent. Dave’s serve takes \( \frac{4}{5} \) of a second. Monica’s serve takes 0.85 of a second. Order the three serves from shortest to longest time.

**Order the fractions and decimals on the number line.**

**STEP 1** Locate the benchmarks on the number line.
- Benchmark decimals: 0, 0.25, 0.5, 0.75, 1.
- Benchmark fractions: 0, \( \frac{1}{4} \), \( \frac{1}{2} \), \( \frac{3}{4} \), 1.

**STEP 2** Locate 0.97, \( \frac{4}{5} \), and 0.85 on the number line.

**STEP 3** Order the fractions and decimals.

Remember: The point farthest to the left is the least value.

So, the times in order from shortest to longest are: \( \frac{4}{5} \), 0.85, 0.97.

Try This! Order 6.03, \( 5 \frac{9}{10} \), \( 5 \frac{3}{4} \), and 6.2 from greatest to least.

- Locate each fraction and decimal on the number line. Use benchmarks to help you locate each.

From the greatest to least: ________, ________, ________, ________.
Locate each number on the number line. Then write the numbers in order from least to greatest.

1. \( \frac{3}{5}, 0.54, 0.35 \)

For 2–3, locate each set of numbers on a number line. Then write the numbers in order from greatest to least.

2. \( 1.16, 1\frac{1}{4}, 1.37, 1\frac{1}{10} \)

3. \( \frac{5}{8}, 0.5, \frac{2}{5}, 0.78 \)

On Your Own

For 4–5, locate each number on a number line. Then write the numbers in order from least to greatest.

4. \( 0.6, 1\frac{1}{2}, \frac{2}{3}, 0.39 \)

5. \( 7\frac{1}{4}, 7.4, 7\frac{3}{4}, 7.77 \)

For 6–7, locate each number on a number line. Then write the numbers in order from greatest to least.

6. \( \frac{3}{10}, 0.222, \frac{3}{5}, 0.53 \)

7. \( 2.96, 3\frac{1}{5}, 3.48, 3\frac{1}{4} \)

Problem Solving

8. Judges in a skateboarding competition gave scores of \( 8.2, 8\frac{1}{3}, 8\frac{4}{5}, 8.44 \), and \( 8\frac{1}{5} \). Which two scores were closest to one another? Explain.
**Unlock the Problem**

Mr. Shu gives this puzzle to his math students.

“Write 24 as a product of factors that are prime. Remember that a prime number must be greater than 1 and can have only 1 and itself as factors.”

You can use a diagram called a **factor tree** to find the factors of a number.

**Use a factor tree to find the prime number factors that have a product of 24.**

<table>
<thead>
<tr>
<th><strong>STEP 1</strong></th>
<th><strong>STEP 2</strong></th>
<th><strong>STEP 3</strong></th>
<th><strong>STEP 4</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Write the number to be factored at the top of the factor tree.</td>
<td>Write it as a product of any two factors. Think: (4 \times 6 = 24)</td>
<td>Write each factor as the product of two factors. Think: (2 \times 2 = 4) and (2 \times 3 = 6)</td>
<td>Continue until each factor is a prime number. Think: (2 \times 1 = 2) and (3 \times 1 = 3)</td>
</tr>
</tbody>
</table>

So, \(24 = \) _______ 

**Math Talk**

**Mathematical Practices**

Explain how you can use factored numbers to find common factors.

---

**Try This!** Make a different factor tree for 24.

- Is the product of factors the same as in the Example? **Explain.**
Share and Show

1. Use a factor tree to find the prime number factors that have a product of 210.
   • Write 210 as a product of any two factors.
     \[
     \text{_____} = \text{_____} \times 21
     \]
   • Write each factor as the product of factors.
     \[
     10 = \text{_____} \times \text{_____} \quad \quad 21 = \text{_____} \times \text{_____}
     \]
   Now each factor has only \_____ and itself as factors.
   So, \[
   210 = \text{_____} \times \text{_____} \times \text{_____} \times \text{_____}.
   \]

Use a factor tree to find the prime number factors.

2. \[
\begin{array}{c}
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8
\end{array}
\]

3. \[
\begin{array}{c}
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8
\end{array}
\]

4. \[
\begin{array}{c}
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8
\end{array}
\]

On Your Own

Use a factor tree to find the prime number factors.

5. \[
\begin{array}{c}
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8
\end{array}
\]

6. \[
\begin{array}{c}
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8
\end{array}
\]

7. \[
\begin{array}{c}
1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8
\end{array}
\]

Problem Solving

Mr. Shu gave these problems to his math students. Solve.

8. Write 500 as a product of prime number factors. Each factor must be greater than 1 and can have only 1 and itself as factors.

9. Find a number that has four identical even factors. Each factor must be greater than 1 and can have only 1 and itself as factors.
Model Percent

Essential Question: How can you express real world quantities as percents and use them to solve problems?

Unlock the Problem

Percent means “per hundred” or “out of 100.” So, when you find percent you are finding a part of 100. Sixty percent, for example, means 60 out of 100. You can write percents using the percent symbol, %. So, 60 percent is written as 60%.

Example 1  Name the percent that is shaded.

• 5 columns: $5 \times 10 = 50$.  
• 3 squares: $3 \times 1 = 3$.  
• Total: $50 + 3 = 53$ out of 100, or 53 percent is shaded.

Example 2  Name the percent that is not shaded.

• 4 columns: $4 \times 10 = 40$.  
• 7 squares: $7 \times 1 = 7$.  
• Total: $40 + 7 = 47$ out of 100, or 47 percent is not shaded.

Try This! Use the number line. Tell what these percents mean:

0 percent, 50 percent, 100 percent.

A. 0 percent means _____ out of 100, or none of the total.
B. 50 percent means _____ out of 100, or half of the total.
C. 100 percent means _____ out of 100, or all of the total.

Math Talk  Mathematical Practices

Which benchmark is 33% closest to? Explain how you know.
Share and Show

Use the diagram to write the percent.

1. How many whole columns and single squares are shaded?

2. What percent is shaded?

3. What percent is unshaded?

Shade the grid to show the percent.

4. 20 percent

5. 86 percent

On Your Own

Use the diagram to write the percent.

6. light shading

7. dark shading

8. not shaded

9. not shaded

10. dark shading

11. light shading

Write the closest benchmark for the percent.

12. 48%

13. 94%

14. 4%

Problem Solving

15. In an election between Warren and Jorge, Warren declared victory because he received 58 percent of the vote. Is he correct? Explain.
Unlock the Problem

Decimals and percents are two ways of expressing the same number. You can write a percent as a decimal. You can also write a decimal as a percent.

Example 1  Model 0.42. Write 0.42 as a percent.

STEP 1  Write the decimal as a ratio.

0.42 = 42 hundredths = 42 out of 100.

STEP 2  Make a model that shows 42 out of 100.

STEP 3  Use the model to write a percent.

42 shaded squares = \( \frac{42}{100} \) percent, or 42%.

Example 2  Model 19 percent. Write 19% as a decimal.

STEP 1  Write the percent as a fraction.

19% = \( \frac{19}{100} \)

STEP 2  Make a model that shows 19 out of 100.

STEP 3  Use the model to write a decimal.

19 shaded squares out of 100 squares = __________

Math Talk

Suppose a store is having a 50% off sale. What does this mean?
Use the model. Complete each statement.

1a. 0.68 = _____ out of 100

1b. How many squares are shaded?

1c. What percent is shaded?

Write the percents as decimals.

2. 47 percent

3. 11 percent

On Your Own

Write the decimals as percents.

4. 0.20

5. 0.39

6. 0.44

7. 0.93

8. 0.07

9. 0.7

10. 0.06

11. 0.6

Write the percents as decimals.

12. 12 percent

13. 31%

14. 99 percent

15. 13 percent

16. 4 percent

17. 14 percent

18. 90 percent

19. 9%

Problem Solving

20. In basketball, Linda made 0.56 of her shots. What percent of her shots did Linda miss?

__________________________________________________________________________
Unlock the Problem

Every percent and decimal number can also be written as a fraction. All fractions can be written as decimals and percents. For example, \( \frac{2}{5} \) of the songs in Bonnie’s music collection are country songs. What percent of her song collection is country?

Write the percent that is equivalent to \( \frac{2}{5} \).

**STEP 1** Set up the equivalent fraction with a denominator of 100.

\[
\frac{2 \times ?}{5 \times ?} = \frac{100}{100}
\]

**STEP 2** Ask: By what factor can you multiply the denominator to get 100?

\[
\frac{2 \times ?}{5 \times 20} = \frac{100}{100} \quad \leftarrow \text{multiply the denominator by 20}
\]

**STEP 3** Multiply the numerator by the same factor, 20.

\[
\frac{2 \times 20}{5 \times 20} = \frac{40}{100}
\]

**STEP 4** Write the fraction as a percent.

\[
\frac{40}{100} = 40 \text{ percent}
\]

So, \( \frac{2}{5} \) equals 40 percent.

More Examples

A. Write \( \frac{8}{25} \) as a decimal.

**STEP 1** Write an equivalent fraction with a denominator of 100.

\[
\frac{8 \times 4}{25 \times 4} = \frac{32}{100} \quad \leftarrow \text{multiply denominator and numerator by 4}
\]

**STEP 2** Write the fraction as a decimal.

\[
\frac{32}{100} = 0.32
\]

B. Write 90 percent as a fraction in simplest form.

**STEP 1** Write 90% as a fraction.

\[
90\% = \frac{90}{100}
\]

**STEP 2** Simplify.

\[
90\% = \frac{90 \div 10}{100 \div 10} = \frac{9}{10}
\]

Math Talk

How are 9% and 90% alike when written as decimals? How are they different?
Share and Show

Complete the steps to write $\frac{7}{20}$ as a percent.

1. By what factor should you multiply the denominator and numerator? __________

\[
\frac{7 \times ?}{20 \times ?} = \frac{?}{100}
\]

2. For $\frac{7}{20}$, what is an equivalent fraction with a denominator of 100?

3. What percent is equivalent to $\frac{7}{20}$?

Write a decimal, a percent, or a simplified fraction.

4. $\frac{1}{4}$ as a decimal

5. $\frac{3}{10}$ as a percent

6. 80% as a fraction

7. $\frac{1}{2}$ as a percent

8. $\frac{9}{10}$ as a decimal

9. $\frac{11}{20}$ as a percent

10. 75% as a fraction

11. $\frac{3}{5}$ as a percent

12. $\frac{9}{25}$ as a decimal

13. $\frac{29}{50}$ as a percent

14. $\frac{1}{20}$ as a percent

15. 4% as fraction

16. $\frac{4}{5}$ as a percent

17. $\frac{24}{25}$ as a decimal

18. $\frac{41}{50}$ as a percent

On Your Own

Write a decimal, a percent, or a simplified fraction.

11. $\frac{3}{5}$ as a percent

12. $\frac{9}{25}$ as a decimal

13. $\frac{29}{50}$ as a percent

14. $\frac{1}{20}$ as a percent

15. 4% as fraction

16. $\frac{4}{5}$ as a percent

17. $\frac{24}{25}$ as a decimal

18. $\frac{41}{50}$ as a percent

Problem Solving

19. Whitney has finished $\frac{9}{20}$ of her book. What percent of the book does Whitney still need to read?

20. Roger has completed $\frac{4}{25}$ of his math homework. What percent of his math homework does he still need to do?
Name _________________________

**Checkpoint**

**Concepts and Skills**

Locate each number on the number line. Then complete the sentence.

1. \(0.4, \frac{3}{5}, 0.35\)

The number with the least value is __________.

Write the numbers in order from least to greatest.

2. \(0.4, \frac{3}{5}, 0.55, \frac{1}{4}\)

3. \(\frac{3}{4}, 0.7, \frac{1}{2}, 0.1\)

Use a factor tree to find the prime number factors.

4. \[16\]

5. \[36\]

6. \[42\]

Write a decimal, a percent, or a simplified fraction.

7. 0.08 as a percent

8. \(\frac{3}{5}\) as a decimal

9. 80% as a fraction

10. \(\frac{13}{20}\) as a percent

**Problem Solving**

For 11–12, use the data in the table.

11. What percent of the apes in the Wild Country Zoo are orangutans?

   _______________________

12. One species makes up 40% of the apes in the zoo. Which species is it?

   _______________________

<table>
<thead>
<tr>
<th>Species</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonobo</td>
<td>4</td>
</tr>
<tr>
<td>Chimpanzee</td>
<td>20</td>
</tr>
<tr>
<td>Gorilla</td>
<td>15</td>
</tr>
<tr>
<td>Orangutan</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>
13. Entries for the Lake Manatee Bass Fishing Contest are shown. First place is awarded to the contestant with the heaviest fish.

<table>
<thead>
<tr>
<th>Lake Manatee Bass Contest</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contestant</td>
<td>Weight of fish caught</td>
</tr>
<tr>
<td>George</td>
<td>6.25 pounds</td>
</tr>
<tr>
<td>Mia</td>
<td>6(\frac{2}{5}) pounds</td>
</tr>
<tr>
<td>Harvey</td>
<td>6(\frac{1}{3}) pounds</td>
</tr>
</tbody>
</table>

What is the correct order from first place to third place?

A) First: George, Second: Mia, Third: Harvey  
B) First: Mia, Second: George, Third: Harvey  
C) First: Mia, Second: Harvey, Third: George  
D) First: Harvey, Second: Mia, Third: George

14. Ric used a factor tree to write 180 as a product of factors that are prime numbers. How many factors were in Ric’s product?

A) 2  
B) 3  
C) 4  
D) 5

15. On Monday, 6% of the students at Riverside School were absent. Written as a decimal, what portion of Riverside’s students attended school that day?

A) 0.06  
B) 0.6  
C) 0.94  
D) 9

16. The Hastings family drove \(\frac{12}{25}\) of the distance to Yellowstone National Park on the first day of their vacation. What percent of the distance to the park remained for them to drive?

A) 12%  
B) 13%  
C) 48%  
D) 52%
Unlock the Problem Real World

Four friends share \( \frac{2}{3} \) of a quart of ice cream equally. What fraction of a quart of ice cream does each friend get?

**Try This!** Divide. \( \frac{3}{4} \div 2 \)

**Divide. \( \frac{3}{4} \div 4 \)**

**STEP 1**
Let the rectangle represent 1 quart of ice cream. Divide it into thirds by drawing vertical lines. Shade 2 of the thirds.

**STEP 2**
Divide the rectangle into fourths by drawing horizontal lines. Shade \( \frac{1}{4} \) of the \( \frac{2}{3} \) already shaded.

**STEP 3**
The rectangle is now divided into _____ equal parts.
Each part is _____ of the rectangle. Of the 12 equal parts, _____ parts are shaded twice. So, _____ of the rectangle is shaded twice.

**Math Talk** Mathematical Practices
Explain why you divided the rectangle into fourths in Step 2.

So, each friend gets __________ of a quart of ice cream.

So, \( \frac{3}{4} \div 2 = _____ \).
Complete the model to find the quotient. Write the quotient in simplest form.

1. \( \frac{5}{6} \div 2 = \) __________
   
   Divide the rectangle into sixths.
   Shade 5 of the sixths.

2. \( \frac{3}{4} \div 3 = \) __________
   
   Divide the rectangle into halves. Shade \( \frac{1}{2} \) of \( \frac{5}{6} \).

3. \( \frac{2}{3} \div 3 = \) __________
   
   Divide the rectangle.

4. \( \frac{3}{5} \div 2 = \) __________
   
   Divide the rectangle into halves. Shade \( \frac{1}{2} \) of \( \frac{5}{6} \).

On Your Own

Complete the model to find the quotient. Write the quotient in simplest form.

5. \( \frac{2}{5} \div 2 = \) __________
   
   Divide the rectangle.

6. \( \frac{5}{8} \div 3 = \) __________
   
   Divide the rectangle.

Draw a model to find the quotient. Write the quotient in simplest form.

7. \( \frac{4}{9} \div 2 = \) __________

8. \( \frac{4}{5} \div 3 = \) __________

Problem Solving

9. Heather, Jocelyn, and Dane are each swimming one leg of a \( \frac{9}{10} \) mile race. They will divide the distance equally. How far will each team member swim?

   ________________________________
Max sells bouquets of roses. There are 3 yellow roses and 2 red roses. What is the ratio of yellow to red roses?

A ratio is a comparison of two numbers.

**Activity**  **Materials**  two-color counters

Model the data.

**STEP 1** Use 3 counters with the yellow side up to represent yellow roses and 2 counters with the red side up to represent red roses.

**STEP 2** Write the ratio of yellow to red roses.

- Ratios can be written in different ways.
  - 3 to 2  or  3:2  or  \( \frac{3}{2} \) (as a fraction)

So, the ratio of yellow roses to red roses is 3 to 2, 3:2, or \( \frac{3}{2} \).

In the example above, you compared a part to a part. You can also use a ratio to compare a part to a whole or a whole to a part.

**Try This!**  Show a ratio of red counters to total counters.

**STEP 1** Count to find the number of red counters.

**STEP 2** Count to find the total number of counters.

**STEP 3** Write the ratio.

**Math Talk**  **Mathematical Practices**

How would the ratio change if you found the ratio of total counters to red counters?
Find the ratio of red counters to yellow counters.

1a. How many red counters are there?

1b. How many yellow counters are there?

1c. What is the ratio of red to yellow counters?

Write the ratio.

2. squares to circles

3. total squares to dark squares

On Your Own

For 4–6, use the drawing to write the ratio.

4. dark to light

5. light to dark

6. light to total

For 7–9, use the drawing to write the ratio.

7. triangles to circles

8. dark to light

9. total shapes to circles

For 10–12, write the ratio.

10. weekdays to weekend days

11. weekend days to days in a week

12. days in a week to days in January

Problem Solving Real World

13. The ratio of length to width in Gus’s driveway is 13 yards to 4 yards. What is this ratio in feet? (Hint: 3 ft = 1 yd)
Unlock the Problem

To make brass, you can mix 2 parts zinc to 3 parts copper, a ratio of 2 to 3. If you have 12 bars of copper and use them all, how many bars of zinc do you need to make brass?

Since ratios can be written as fractions, 2 to 3 can be written as \(\frac{2}{3}\). Use what you know about equivalent fractions to find equivalent ratios.

Use a diagram to find an equivalent ratio.

**STEP 1** Draw bars to represent a 2 to 3 ratio of zinc to copper.

**STEP 2** Add groups until you have 12 bars of copper.

**STEP 3** Count the zinc bars. Write an equivalent ratio.

There are 8 zinc bars. So, 2 to 3 is equivalent to the ratio 8 to 12.

**Try This!** Use equivalent ratios to find out if 6:8 is equivalent to 18:24.

**STEP 1** Write the ratios as fractions.

\[
6:8 = \frac{6}{8} \quad 18:24 = \frac{18}{24}
\]

**STEP 2** Write the fractions in simplest form. Then compare.

\[
\frac{6}{8} = \frac{6 \div 2}{8 \div 2} = \frac{3}{4} \quad \frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}
\]

Both ratios equal \(\frac{3}{4}\), so they are equivalent.
Are the ratios 3:5 and 12:20 equivalent?

1a. Write both ratios as fractions.

______

1b. Are both ratios in simplest form?

______

1c. Write both ratios in simplest form.

______

1d. Are the ratios equivalent?

______

Write equivalent or not equivalent.

2. 1 to 3 and 2 to 6

______

3. 3 to 7 and 12 to 21

______

On Your Own

Write the equivalent ratio.

4. 5 to 2 = _____ to 4

5. 3 to 6 = 7 to _____

6. 7:2 = _____ :6

7. 14 to 21 = _____ to 15

8. 6:10 = _____ :30

9. 8 to 9 = 40 to _____

Write equivalent or not equivalent.

10. 3:5 and 21:35

______

11. 4 to 3 and 36 to 24

______

12. 27:72 and 9:24

______

Problem Solving

13. Three of every 5 pizzas that Miggy's Pizza sells are cheese pizzas. Miggy's sold 80 pizzas today. How many of them would you expect were cheese?

______
Unlock the Problem

**CONNECT** You know how to write ratios to compare two quantities. A **rate** is a ratio that compares two quantities that have different units of measure. A **unit rate** is a rate that has 1 unit as its second term.

Rafael is shopping at a used book and music store. A sign advertises 4 CDs for $12. What is the unit rate for the cost of 1 CD?

**Write the rate in fraction form. Then find the unit rate.**

**STEP 1**
Write the rate in fraction form to compare dollars to CDs.

\[
\frac{\text{dollars}}{\text{CDs}} = \frac{12}{4}
\]

**STEP 2**
Divide to find an equivalent rate so that 1 is the second term.

\[
\frac{12}{4} = \frac{12 \div 4}{4 \div 4} = \frac{12}{4} = 1
\]

So, the unit rate for CDs is ______ for 1 CD.

**What if** the regular price of CDs is 5 for $20? What is the unit rate for CDs at the regular price? **Explain** how you found your answer.

---

**STEP 1**
Write the rate in fraction form to compare dollars to CDs.

\[
\frac{\text{dollars}}{\text{CDs}} = \frac{12}{4}
\]

**STEP 2**
Divide to find an equivalent rate so that 1 is the second term.

\[
\frac{12}{4} = \frac{12 \div 4}{4 \div 4} = \frac{12}{4} = 1
\]

So, the unit rate for CDs is ______ for 1 CD.

**What if** the regular price of CDs is 5 for $20? What is the unit rate for CDs at the regular price? **Explain** how you found your answer.
Share and Show

1. Find the unit rate of speed for 120 miles in 2 hours.

\[
\begin{align*}
\text{miles} & \quad 120 \quad \text{hours} \\
\text{hours} & \quad 2
\end{align*}
\]

The unit rate of speed is _______________ per _______________.

Find the unit rate.

2. $5.00 for 2 T-shirts

3. 200 words in 4 min

4. 150 mi on 10 gal of gas

On Your Own

Write the rate in fraction form.

5. 90 words in 2 min

6. $1.20 for 6 goldfish

7. $0.05 per page

Find the unit rate.

8. $208 for 4 tires

9. 300 mi per 15 gal

10. 240 people per 2 sq mi

Problem Solving

11. An ice skating rink charges $1.50 to rent ice skates for 30 minutes. What is the unit rate per hour for renting ice skates?
Unlock the Problem

You can use the formula \( d = r \times t \) to solve problems involving distance, rate, and time. In the formula, \( d \) represents distance, \( r \) represents rate, and \( t \) represents time. The rate is usually a unit rate comparing distance to time, such as miles per hour.

**Example 1**

The winner of an automobile race drove 500 miles at an average speed of 150 miles per hour. How long did it take the winner to finish the race?

**STEP 1**
Write the formula.
\[ d = r \times t \]

**STEP 2**
Replace \( d \) with 500 and \( r \) with 150.
\[
\begin{align*}
d &= r \times t \\
500 &= \underline{ } \times t
\end{align*}
\]

**STEP 3**
Use what you know about inverse operations to find \( t \).
\[
500 ÷ 3 \frac{1}{3} = t
\]

So, it takes the winner ______ hours or ______ hours ______ minutes to complete the race.

**Example 2**

A race car driver traveled at an average speed of 120 miles per hour to finish a race in 2 hours. What was the length of the race?

**STEP 1**
Write the formula.
\[ d = r \times t \]

**STEP 2**
Replace \( r \) with 120 and \( t \) with 2.
\[
\begin{align*}
d &= r \times t \\
d &= \underline{ } \times \underline{ }
\end{align*}
\]

**STEP 3**
Multiply to solve for \( d \).
\[
\begin{align*}
d &= 120 \times 2 \\
d &= \underline{ }
\end{align*}
\]

So, the race was ______ miles long.
1. A cyclist travels 45 miles in 3 hours. What is the cyclist’s speed?

Write the formula: \( d = \square \times \square \)

Replace \( d \) with ____.
Replace \( t \) with ____.

The rate is ____ miles per hour.

Use the formula \( d = r \times t \) to solve. Include the units in your answer.

2. A train travels at an average speed of 80 miles per hour for 5 hours. How far does the train travel?

3. A horse travels at an average speed of 12 miles per hour. How long does it take the horse to travel 60 miles?

On Your Own

Use the formula \( d = r \times t \) to solve. Include the unit in your answer.

4. A hiker travels at a speed of 3 miles per hour for 3 hours. How far does the hiker travel in that time?

5. A snail travels at a speed of 2 centimeters per minute. How long does the snail take to travel 30 centimeters?

6. A boat travels 6 miles in 24 minutes. What is the average speed of the boat?

7. \( d = 320 \text{ cm} \)

\( r = \square \)

\( t = 8 \text{ sec} \)

8. \( d = \square \)

\( r = 50 \text{ km per hr} \)

\( t = 6 \text{ hr} \)

9. \( d = 150 \text{ ft} \)

\( r = 20 \text{ ft per min} \)

\( t = \square \)

Problem Solving

10. In an experiment, Ava found that it took a ball 5 seconds to roll down an 80-foot ramp. What is the average speed of the ball?

11. Jason’s family is driving 1,375 miles to Grand Canyon National Park. They plan to drive at an average speed of 55 miles per hour. How long will they be driving to reach the park?
Name ________________________________

✓ Checkpoint

Concepts and Skills

Draw a model to find the quotient. Write the quotient in simplest form.

1. \( \frac{3}{4} \div 3 \)  
2. \( \frac{2}{3} \div 5 \)  
3. \( \frac{3}{7} \div 2 \)

For 4—6, use the drawing to write the ratio.

4. squares to triangles  
5. total to dark  
6. triangles to total

Write the equivalent ratio.

7. 8 to 3 = _____ to 12  
8. 2 to 6 = 4 to ____  
9. 11:4 = ____ :16

Find the unit rate. (pp. P243–P244)

10. 45 visitors with 5 tour guides  
11. 450 mi on 15 gal of gas  
12. $56 in 8 hr

Use the formula \( d = r \times t \) to solve the problem. Include the units in your answer.

13. \( d = \) _________  
14. \( d = 90 \) ft  
15. \( d = 300 \) mi

\[ r = 40 \text{ km per hr} \]  
\[ r = 10 \text{ ft per sec} \]  
\[ r = \] _________

\[ t = 3 \text{ hr} \]  
\[ t = \] _________  
\[ t = 4 \text{ hr} \]

Problem Solving

Use the table for 16–17.

16. Fuel efficiency can be written as a rate comparing the distance driven to the gallons of gas used. What is the fuel efficiency of Car A written as a unit rate?

<table>
<thead>
<tr>
<th>Car</th>
<th>Distance (in mi)</th>
<th>Gas (in gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>308</td>
<td>14</td>
</tr>
<tr>
<td>B</td>
<td>288</td>
<td>12</td>
</tr>
</tbody>
</table>

17. During the test, Car B was driven at the speed of 48 miles per hour. How long did the test take?
18. To make fruit punch for a party, Alison used 3 quarts of pineapple juice and 2 gallons of orange juice. There are 4 quarts in a gallon. What is the ratio of pineapple to orange juice in quarts?

A 3 to 2
B 3 to 5
C 3 to 8
D 8 to 3

19. Three out of every 10 pairs of skis sold by Snow Sports are cross-country skis. Snow Sports sold 450 pairs of skis during the winter season. How many of the skis were likely to have been cross-country skis?

A 443
B 135
C 45
D 30

20. At Greentree Elementary School, there are 72 fifth graders in 3 classrooms. What unit rate describes this situation?

A $14 \frac{2}{5}$ fifth graders per class
B 18 fifth graders per class
C 24 fifth graders per class
D 216 fifth graders per class

21. Eduardo rides his bicycle for 6 hours. What was Eduardo’s average speed if he rides a distance of 84 miles? Use the formula $d = r \times t$.

A 504 mi per hr
B 90 mi per hr
C 78 mi per hr
D 14 mi per hr
Understand Integers

**Essential Question** How can you use positive and negative numbers to represent real world quantities?

**Unlock the Problem**

**Connect** You have used a number line to show 0 and whole numbers. You can extend the number line to the left of 0 to show the **opposites** of the whole numbers. For example, the opposite of +3 is −3. Any whole number or the opposite of a whole number is called an **integer**.

![Number Line]

Negative integers are written with a negative sign, −. Positive integers are written with or without a positive sign, +.

**Example 1**

The temperature in Fairbanks, Alaska, was 37 degrees below zero. Write an integer to represent the situation.

**STEP 1** Decide whether the integer is positive or negative.

The word **tells me that the integer is** ________.

**STEP 2** Write the integer: __________.

So, the temperature in Fairbanks was __________ degrees.

**Example 2**

The Koala Bears gained 11 yards on a football play. Write an integer to represent the situation. Then, tell what 0 represents in that situation.

**STEP 1** Decide what positive integers and negative integers represent.

Positive integers represent yards ____________

Negative integers represent yards ____________.

**STEP 2** Decide what 0 represents.

So, 0 means yards were neither ____________ nor ____________.
Write an integer to represent the situation.

1. a loss of $25
   The word loss represents an integer that is ________.
   The integer that represents the situation is ________.

2. 73 degrees above zero ________

3. 200 feet below sea level ________

4. a profit of $76 ________

Write an integer to represent the situation. Then, tell what 0 represents.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Integer</th>
<th>What Does 0 Represent?</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. The passenger jet flew at an altitude of 34,000 feet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Zack lost 45 points on his first turn.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Craig was 20 minutes early for his appointment.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Write an integer to represent the situation.

8. the temperature went up 2 degrees ________

9. 11 feet below sea level ________

10. an increase of 37 students ________

11. 15 seconds before rocket liftoff ________

Write an integer to represent the situation. Then, tell what 0 represents.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Integer</th>
<th>What Does 0 Represent?</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Amelia earned $1,200 in one week.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. The coal was 2 miles below ground level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. The alarm clock rang 5 minutes early.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Problem Solving

15. Gina withdrew $600 from her checking account to pay for her new guitar. What integer can you write to represent the withdrawal? What does 0 represent?
Montel hires Shea to buy some tools for him at the hardware store. Montel will pay Shea $5 more than the cost of the tools she buys.

A. How can you represent this payment as an expression?

B. How can you use the expression to calculate what Montel will pay Shea?

Write an expression for what Montel will pay.

STEP 1 Choose a variable and explain what it stands for.

Let \( c \) equal the cost of the tools.

STEP 2 Write a word expression.

$5 more than the cost.

STEP 3 Replace the word expression with an addition expression using \( c \).

So, an expression that tells how much Montel owes Shea is \( 5 + c \).

Try This! If the tools cost a total of $18, how much will Montel pay Shea?

Evaluate the expression \( 5 + c \) for \( c = 18 \).

STEP 1 Write the expression.

STEP 2 Replace \( c \) with _________.

\( 5 + \) _________

STEP 3 Add to evaluate.

\( 5 + 18 = \) _________

So, Montel will pay Shea _________.
Write an expression.
Tallahassee’s temperature is 15 degrees less than the temperature in Miami.

1a. What operation does the phrase less than suggest?

1b. Write a word expression:

1c. Write an expression for Tallahassee’s temperature. Let $m$ stand for the temperature in Miami.

1d. Evaluate the expression for Tallahassee’s temperature for $m = 90$.

Evaluate each expression for the value given.

2. $b - 45$ for $b = 70$

3. $13 + a$ for $a = 40$

On Your Own

Write an expression.

4. Zeke has some tropical fish, $f$. Dean gave Zeke 5 new fish. How many fish does Zeke have now?

5. Myra had some candles, $c$. She used up 12 of them. How many candles does Myra have now?

Evaluate each expression for the value given.

6. $s - 18$ for $s = 80$

7. $49 + k$ for $k = 31$

8. $w \times 6$ for $w = 13$

9. $60 \div n$ for $n = 20$

10. $t \times 12$ for $t = 8$

11. $r - 25$ for $r = 110$

Problem Solving

12. Keith is 2 inches shorter than his sister. If $s$ represents his sister’s height, what expression can you write that represents Keith’s height?
Every morning, Bobbi’s Hot Bagels makes a special claim. All bagels Bobbi’s sells will be warm and less than 9 minutes old. What inequality can you write to represent in whole minutes how old Bobbi’s bagels are?

An inequality is a number sentence that compares two unequal quantities and uses the symbols $<$, $>$, $\leq$, or $\geq$.

Write an inequality using a variable.

STEP 1 Write the inequality in words.

STEP 2 Replace time with the variable $t$.

STEP 3 Replace the words less than with a less than ($<$) symbol.

$t < 9$

Try This! Graph the solutions on the number line. Of 3, 6, 9, and 12, which numbers are solutions for $t < 9$?

STEP 1 In $t < 9$, replace $t$ with 3. Repeat the process for $t = 6$, 9, 12.

$3 < 9 \quad \text{true}$

STEP 2 Identify the values that make $t < 9$ true.

True values are solutions: $t = 3$, 6.
False values are not solutions: $t \neq 9$, 12.

STEP 3 Graph the solutions on a number line. Graph true values with filled circles.

How does the answer for the problem change if the inequality is “$t$ is less than or equal to 9”?
Of 2, 5, and 8, which numbers are solutions for the inequality $x \geq 5$?
Graph the solutions on the number line.
1a. Replace $x$ with 2. True or false?
   ________________________________
1b. Replace $x$ with 5. True or false?
   ________________________________
1c. Replace $x$ with 8. True or false?
   ________________________________

Show two solutions for the inequality on a number line.
2. $a < 6$
   ________________________________

Of 7, 10, and 13, which numbers are solutions for the inequality?
3. $m > 8$
   ________________________________
4. $b \leq 10$
   ________________________________
5. $c < 15$
   ________________________________

Of 0, 4, 6, and 11, which numbers are solutions for the inequality?
6. $d \geq 8$
   ________________________________
7. $r < 1$
   ________________________________
8. $s > 4$
   ________________________________

Show two solutions for the inequality on a number line.
9. $n \leq 6$
   ________________________________
10. $x > 2$
    ________________________________

For her birthday party, Dina wants to invite at least 8 guests but not more than 12 guests. How many guests might she have? Name all of the possibilities.
   ________________________________
**Concepts and Skills**

**Write an integer to represent the situation.**

1. a shark 125 feet below sea level ___________  
2. a bank deposit of 300 dollars ___________

**Write an integer to represent the situation. Then, tell what 0 represents.**

<table>
<thead>
<tr>
<th>Situation</th>
<th>Integer</th>
<th>What Does 0 Represent?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. a gain of 13 yards by a football team</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. a temperature of 25 degrees below zero</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Write an expression. Then evaluate the expression for the value given.**

5. Miki has \( n \) dollars. Dora has 3 more dollars than Miki. How many dollars does Dora have? Evaluate for \( n = 14 \).

6. Chip has \( s \) shells. Gina has 4 times as many shells as Chip. How many shells does Gina have? Evaluate for \( s = 6 \).

**Of 1, 3, 4, and 8, which numbers are solutions for the inequality?**

7. \( a < 7 \)  
8. \( b \geq 3 \)  
9. \( c > 4 \)  
10. \( d \leq 8 \)

**Problem Solving**

Filters are set up to sort pennies, dimes, and nickels. A penny is 19 mm wide, a dime is 17.9 mm wide, and a nickel is 21 mm wide. Coins less than 20 mm wide will pass through the first level, and coins less than 18.5 mm wide will pass through the second level.

11. If you drop a large number of all 3 coins from above, which coins will be caught at Level 1? Which coins will pass through?

12. Which coins will be caught at Level 2? Which coins will pass through?
Fill in the bubble completely to show your answer.

13. The lowest temperature ever recorded in North Dakota was 60 degrees below zero Fahrenheit. Which integer represents the temperature?

A 0
B 60
C -60
D -0

14. In football, a team receives 3 points for each field goal it makes. Which expression shows the number of points a team will receive for making $f$ field goals?

A $3 + f$
B $3 \times f$
C $f - 3$
D $f \div 3$

15. The elevation of Central City is 84 feet above sea level. Which integer is the opposite of 84?

A 48
B +84
C -48
D -84

16. Uncle Louie is at least 1 inch shorter than Miriam, and at least 2 inches taller than Jeffrey. Jeffrey’s height is 64 inches. Miriam is not more than 5 inches taller than Jeffrey. Which answer choice could be Uncle Louie’s height?

A 65 inches
B 67 inches
C 69 inches
D 70 inches
Camille is designing an indoor greenhouse on a coordinate grid. The floor of the greenhouse is a polygon. The vertices of the polygon can be graphed using the coordinates shown in the table. Plot and describe the floor of the greenhouse.

**Unlock the Problem**

### Real World

Camille is designing an indoor greenhouse on a coordinate grid. The floor of the greenhouse is a polygon. The vertices of the polygon can be graphed using the coordinates shown in the table. Plot and describe the floor of the greenhouse.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

**STEP 1** Write ordered pairs.

Use each row of the table to write an ordered pair.

(10, 1), (2, _ ), ( _ , _ ),
( _ , _ ), ( _ , _ ).

**STEP 2** Graph a point for each pair on the coordinate grid.

**STEP 3** Connect the points.

So, the floor of the greenhouse is a ________________.

• What if the greenhouse floor had only four of the five vertices given in the table and did not include (6, 10). What would the shape of the floor be? ________________

A parallelogram on a coordinate grid has vertices at (3, 4), (6, 1), and (8, 4). What are the coordinates of the fourth vertex? **Explain** how you found the answer.

**Math Talk**

Suppose you know the vertices of a polygon. How can you identify what type of polygon it is without plotting the vertices on a coordinate grid?
5. A football field is a rectangle measuring 300 ft by 160 ft. Each unit on a coordinate grid represents 1 foot. (0, 0) and (0, 160) are two of the coordinates of a football field drawn on the grid. What are the coordinates of the other two vertices?
Unlock the Problem

The souvenir stand at Mighty Grasshopper basketball games sells parallelogram-shaped pennants. Each pennant has a base of 12 inches and a height of 5 inches.

Activity Find the area of the parallelogram.

Materials ■ grid paper ■ scissors

STEP 1 Draw the parallelogram on grid paper and cut it out.

STEP 2 Cut along the dashed line to remove a right triangle.

STEP 3 Move the right triangle to the right side of the parallelogram to form a rectangle.

STEP 4 The base of the rectangle measures ______ inches.

The height of the rectangle measures ______ inches.

The area of the rectangle is

\[12 \times \_\_] = \_\_\_\_\_\_ square inches.

• Explain why the area of the parallelogram must equal the area of the rectangle.

So, the area of a pennant is

\[\_\_\_\_ \times \_\_\_\_ = \_\_\_\_\_\_\_\_\_ square inches.\]
Find the area of the parallelogram.

1. \( A = b \times h \)
   \[ A = 8 \times 4 \]
   \[ A = \underline{32} \text{ sq cm} \]

2. \[ A = \underline{200} \text{ sq in.} \]

3. \[ A = \underline{117} \text{ sq m} \]

4. \[ A = \underline{35} \text{ sq yd} \]

5. \[ A = \underline{288} \text{ sq in.} \]

6. \[ A = \underline{14.625} \text{ sq cm} \]

7. base = 0.6 cm
   height = 0.15 cm
   \[ A = \underline{0.225} \text{ sq cm} \]

8. base = 1.8 m
   height = 2.9 m
   \[ A = \underline{4.98} \text{ sq m} \]

9. base = 1\frac{1}{2} \text{ ft}
   height = \frac{3}{8} \text{ ft}
   \[ A = \underline{1.875} \text{ sq ft} \]

10. base = 4\frac{1}{3} \text{ in.}
    height = 20 \text{ in.}
    \[ A = \underline{165} \text{ sq in.} \]

11. Carla made a border for her garden using parallelogram-shaped tiles. Each piece had a base of 4 in. and a height of 2\frac{1}{2} in. She used 85 tiles. What was the total area of the border?
Name ________________________________

**Median and Mode**

**Essential Question** How can you describe a set of data using median and mode?

The **median** of a set of data is the middle value when the data are written in order. For example, a baseball team scored 6, 2, 6, 0, and 3 runs in five games. The median is 3 runs: 0, 2, 3, 6, 6.

If there is an even number of data items, the median is the sum of the two middle items divided by 2.

The **mode** of a set of data is the data value or values that occur most often. A data set may have no mode, one mode, or several modes. The mode of the data set of baseball runs is 6.

---

**Unlock the Problem**

For the Science Fair, Ronni grew 9 sweet pea plants under different conditions. Here are the plants’ heights, in centimeters: 11, 13, 6, 9, 15, 7, 9, 17, 12.

What are the median and mode of the data?

1. **Find the median and mode.**

   **STEP 1** Order the heights from least to greatest.
   
   6, 7, ___, ___, ___, ___, ___, ___, ___, ___, ___

   **STEP 2** Circle the middle value.
   
   So, the median is ____ centimeters.

   **STEP 3** Identify the data value that occurs most often. ____ occurs two times.
   
   So, the mode is ____ centimeters.

---

**Try This!** Find the median and mode of the numbers: 8, 11, 13, 6, 4, 3.

**STEP 1** Order the numbers from least to greatest.

____, ____ , ____ , ____ , ____ , ____ , 13

**STEP 2** There is an even number of data items, so divide the sum of the two middle items by 2. \( \frac{6 + ___}{2} = \frac{2}{2} = ____ \)

So, the median is = ____.

**STEP 3** ____ data value appears more than once.

So, the data set has ____ mode.
Find the median and the mode of the data.

1. puppies’ weights (pounds): 8, 3, 5, 3, 2, 6, 3
   Order the weights: ________________________
   The median, or middle value, is ____ pounds
   The mode, or most common value, is ____ pounds.

2. numbers of students in math classes:
   25, 21, 22, 18, 23, 24, 25
   median: ___________ students
   mode: ___________ students

3. numbers of 3-point baskets made:
   2, 0, 5, 4, 5, 2, 5, 2
   median: ___________ 3-point baskets
   mode: ___________ 3-point baskets

4. movie ticket prices ($):
   8, 8, 6, 8, 7, 6, 8, 10, 8, 6
   median: $___________
   mode: $___________

5. ages of first 10 U.S. presidents when inaugurated:
   57, 61, 57, 57, 58, 57, 61, 54, 68, 51
   median: ___________ years
   mode: ___________ years

6. weights of rock samples (pounds):
   39, 28, 21, 47, 40, 33
   median: ___________ pounds
   mode: ___________ pounds

7. lengths of humpback whale songs (minutes): 25, 29, 31, 22, 33, 31, 26, 22
   median: ___________ minutes
   mode: ___________ minutes

8. Sascha’s test scores:
   90, 88, 79, 97, 100, 97, 92, 88, 85, 92
   median: ___________
   mode: ___________

9. Adrian recorded the daily high temperatures the first two weeks of July. What were the median and mode of her data?
   median: ____________ °F
   mode: ____________ °F

<table>
<thead>
<tr>
<th>Daily High Temperatures (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
</tr>
<tr>
<td>101</td>
</tr>
</tbody>
</table>
Unlock the Problem

Jonathon and Pilar are practicing to be a juggling team. The table shows the number of seconds they were able to keep 4 balls in the air without making a mistake. What was the average number of seconds they were able to juggle?

<table>
<thead>
<tr>
<th>Trial</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>32</td>
</tr>
<tr>
<td>b</td>
<td>8</td>
</tr>
<tr>
<td>c</td>
<td>62</td>
</tr>
<tr>
<td>d</td>
<td>55</td>
</tr>
<tr>
<td>e</td>
<td>13</td>
</tr>
</tbody>
</table>

STEP 1 Find the sum of the seconds.  
$$32 + 8 + 62 + 55 + 13 = 170$$

STEP 2 How many numbers did you add?  
5 numbers

STEP 3 Divide the sum by the number of addends.  
$$\frac{34}{5} \text{ per trial}$$

How many trials did they record?  
5 trials

So, the average time that Jonathon and Pilar kept 4 balls in the air was 34 seconds per trial.

Try This! Find the average of 61, 99, 106, 3, 44, and 89.

STEP 1 Find the sum.  
$$61 + 99 + 106 + 3 + 44 + 89 = 402$$

STEP 2 Divide the sum by the number of addends.  
$$402 \div 6 = 67$$

So, the average of 61, 99, 106, 3, 44, and 89 is 67.

Math Talk Mathematical Practices

Use the jugglers’ average time per trial. What might you expect of them in their next trial?
Tommy’s basketball scoring record is shown for this month. What was the average number of points that Tommy scored per game?

1a. Find the sum of the points Tommy scored.


1b. How many numbers did you add to find the sum in Exercise 1?


1c. Divide the sum by the number of games. What is the average number of points per game?

Find the average of the set of numbers.

2. 6, 9, 14, 4, 12

3. 44, 55, 33, 22, 40, 40

On Your Own

Find the average of the set of numbers.

4. 4, 8, 12, 14, 15, 19

5. 28, 20, 31, 17

6. 100, 140, 60, 120, 180

7. 17, 91, 49, 73, 115, 27

8. 5, 8, 13, 4, 22, 6, 0, 5, 9

9. 637, 492, 88, 743

10. 2,439; 801; 1,508; 0

11. 13, 12, 11, 13, 15, 19, 22, 13, 19

12. 78, 61, 51, 99, 8, 112, 76, 32, 59

13. Find the average temperature.


14. In the temperature table above, suppose the temperature for the next 2 days was 70 degrees. By how much would this change the average temperature over the entire period?
Unlock the Problem

*Activity* The table below shows the ages of the members of a bicycle club. Make a histogram of the data. A histogram is a bar graph that shows how often data occur in intervals.

<table>
<thead>
<tr>
<th>Ages of Members in a Bicycle Club</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 38 29 41 40 35 50 20 47 22 19 21 18 17</td>
</tr>
<tr>
<td>26 30 41 43 52 45 28 25 39 24 23 25 50 59</td>
</tr>
</tbody>
</table>

**STEP 1** Make a frequency table with intervals of 10. Fill in the frequencies.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10–19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20–29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50–59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STEP 2** Choose an appropriate scale and interval for the vertical-axis, and list the intervals on the horizontal axis. Label each axis.

**STEP 3** Draw a bar for each interval. Give the histogram a title.

---

**Math Idea**

In a histogram, the bars touch because they represent continuous intervals.

- **What if** you changed the histogram to show four age groups with 12-year intervals?

  How would the histogram change?

---

**Math Talk**

Mathematical Practices

Explain how a histogram and a bar graph with categories are different.
For 1–3, use the data below.
The number of vacation days that each employee of a company took last summer is given below.

2, 5, 6, 11, 3, 5, 7, 8, 10, 1, 4, 6, 10, 5, 12, 15, 6, 8, 7, 14

1. Start at 1 day and use 4 days for each interval. List the intervals.

2. Complete the frequency table.

<table>
<thead>
<tr>
<th>Number of Days</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5–8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9–12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13–16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Complete the histogram.

For 4–6, use the data below.
The number of minutes that each student in Mrs. Green’s class spent on homework last night is given below.

45, 30, 55, 35, 50, 48, 60, 38, 47, 56, 40, 39, 55, 65, 49, 34, 35

4. Start at 30 and use 10-minute intervals for the data. List the intervals.

5. Make a frequency table of the data.

6. Make a histogram of the data.

For 7, use the data below.
The number of words per minute that one class of students typed is given below.

30, 45, 28, 35, 48, 37, 41, 44, 34, 29, 25, 32, 40, 45, 39, 49

What are reasonable intervals for the data?
The histogram shows the number of items sold at a garage sale within each price range.

**Garage Sale**

<table>
<thead>
<tr>
<th>Prices</th>
<th>Number of Items Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1–$5</td>
<td>8</td>
</tr>
<tr>
<td>$6–$10</td>
<td>6</td>
</tr>
<tr>
<td>$11–$15</td>
<td>4</td>
</tr>
<tr>
<td>$16–$20</td>
<td>2</td>
</tr>
<tr>
<td>$21–$25</td>
<td>1</td>
</tr>
</tbody>
</table>

**Unlock the Problem**

1. **How many of the items sold cost $6 to $10?**
   - Find the interval labeled $6–$10.
   - Find the frequency.
   - The bar for $6–$10 shows that _____ items were sold.
   - So, _____ of the items sold cost $6 to $10.

2. **How many of the items sold cost $16 to $25?**
   - Find the frequencies for the intervals labeled $16–$20 and $21–$25.
   - The bar for $16–$20 shows that _____ items were sold. The bar for $21–$25 shows that _____ items were sold.
   - Add the frequencies.
   - 7 + _____ + _____
   - So, _____ of the items sold cost $16 to $25.

**ERROR Alert**

Remember to read the intervals. For some questions, you may need to combine data from two or more intervals in order to answer the question.

**Math Talk**

**Mathematical Practices**

Explain why you cannot tell from the histogram the total amount of money that was made during the garage sale.
For 1–3, use the histogram at the right.

1. The histogram shows the number of days in one month whose temperatures were within each temperature range. On how many days was the temperature at or above 70°F?
   - List the bars that represent temperatures at or above 70°F. ______ and ______
   - The frequency for interval 70–74 is ______, and the frequency for interval 75–79 is ______.
   - Add the frequencies. ______ + ______ + ______

   The daily high temperature was at or above 70°F on ______ days.

2. On how many days was the temperature 65°F to 69°F? ______

3. On how many days was the temperature less than 65°F? ______

For 4–5, use the histogram at the right.

4. Which interval has the greatest frequency? ______

5. How many days did Maxine ride the stationary bike for 30 or more minutes? ______

For 6–7, use the histogram at the right.

6. How many people voted in the election? ______

7. How many more voters were there from ages 41–50 than from ages 21–30? ______
Name ________________________________

**Checkpoint**

## Concepts and Skills

1. Plot and identify the polygon with vertices at (4, 0), (8, 7), (4, 7), and (8, 0).

2. A parallelogram has a base of 8.5 cm and a height of 6 cm. What is the area of the parallelogram?

3. Find the median and mode of Erin’s math scores:
   93, 88, 85, 93, 100, 95, 85, 89.
   - median __________________
   - mode __________________

4. Find the average of the following temperatures:
   59°F, 66°F, 59°F, 67°F, 54°F, 64°F, 72°F.
   - average __________________

For 5–7, use the data below.

The math test scores for Miss Jackson’s class are given below.

88, 94, 86, 78, 65, 83, 71, 74, 92, 73,
95, 71, 100, 98, 68, 85, 81, 93, 89, 84

5. Make a histogram for the data using intervals of 10.

6. Which interval has the greatest frequency?

7. How many students received grades greater than 80? __________

For 8–9, use the histogram. The histogram shows the times that people wake up in the morning.

8. How many people were surveyed?

9. How many more people surveyed wake up between 6:30 and 6:59 than between 7:30 and 7:59?
   ________________________________
10. On a map of the town of Barton, City Hall Park has three of its four vertices at (15, 0), (5, 0), and (15, 9). City Hall Park is a rectangle. What are the coordinates of the park’s fourth vertex?  
   A (5, 9)  
   B (9, 5)  
   C (5, 15)  
   D (9, 15)

11. A window at an art gallery is shaped like a parallelogram. The base measures 1.2 meters and the height measures 0.8 meters. What is the area of the window?  
   A 0.48 sq m  
   B 0.96 sq m  
   C 1.92 sq m  
   D 2.0 sq m

12. The ages of the members of the Chess Club are given below. What is the median age?  
   13, 9, 10, 9, 14, 13, 8, 9  
   A 9  
   B 9.5  
   C 10  
   D 10.5

13. The histogram shows the ages of runners in a half-marathon. How many runners are between the ages of 21 and 40?  
   A 24  
   B 30  
   C 42  
   D 54